

REMARKS

In the Office Action dated August 18, 2006, claims 1-13 and 15-18 are pending, claims 16-18 are withdrawn from consideration and claims 1-13 and 15 are rejected. Reconsideration is requested for at least the reasons discussed hereinbelow.

Objection is made to claim 11. The above amendment, which was kindly suggested by the Examiner, overcomes this objection.

Claims 1 and 12 also are amended to further clarify the presently claimed invention. Support for the amendments to claims 1 and 12 can be found, e.g., in Figure 2, and on page 31, lines 7-16 of OS1, wherein the optical axis (E-E') of the interlayer lens is shown to match the central axis (D-D') of the corresponding opening 19x on the light receiving portion 12 (a line perpendicular to the semiconductor substrate 11 running through the center of the corresponding opening 19x). In other words, the optical axis of each of the interlayer lenses 21a is aligned with the central axis of the corresponding opening region 12x of the light receiving portion 12. Applicants submit that this clarification does not change the scope of the claims; it merely states what previously was inherent.

Claims 1-6, 8-13 and 15 [claim 14 was cancelled previously] are rejected under 35 U.S.C. §102(b) over JP 2000-164837 ("JP '837"). The Examiner states, in pertinent part, with reference to figure 6 that JP '837 discloses a semiconductor apparatus

having an opening region for light associated to the light input/output portion 12 to pass through (the opening is not labelled but is located between the inner edges of layer 5), the opening region having a central axis and being bounded by a light shielding layer 5 wherein a cross-section is asymmetric to the central axis (since the cross-section in claim 1 is not defined as the cross section as any particular layer or taken in any particular direction or plane this limitation is met by the reference, note that a cross section, for instance at a 45 degree angle in figure 6 which passes through the central axis is asymmetric).

Applicants respectfully disagree. It is quite clear from the original disclosure that the asymmetric cross section means the cross section showing the light shielding layers with respect to a central axis as illustrated, for example, in present FIG. 2. Figure 6 of JP '837 clearly shows that the light shielding layer is symmetric about a center axis through the opening. The Examiner's proposed interpretation is not consistent with the invention disclosure or the technology involved.

JP'837 Figure 6 illustrates a semiconductor structure that is substantially different from that described in present application Figure 2. JP'837 Figure 6 shows a light shield layer that is symmetrical about a center axis; it has horizontal portions in the same plane as the transfer electrode which portions are of equal length. To the contrary, in the present invention, the horizontal portions of the light shield layer 19 are not equal (i.e., not symmetrical around a center axis).

Thus the present invention, as set forth in claim 1, provides a semiconductor apparatus having at least the following features:

Feature A: "the interlayer lens positioned such that an optical axis of the interlayer lens is parallel to the central axis of the opening region".

Feature B: "the opening region having a central axis and being bounded by a light shielding layer wherein a cross-section is asymmetric to the central axis".

As discussed previously, Feature A provides the advantage that the light is efficiently received by the light receiving layers (as described on page 34, lines 1-8 of the original specification). An advantage which can be achieved by Feature B is discussed on page 37, lines 20-24, i.e., the light shielding film securely blocks the channel stopper portions from the light.

JP'837 fails to teach or suggest a light shielding layer wherein a cross-section is asymmetric to the central axis of the opening region. JP'837 discloses the use of a light shielding layer 5, portions of which are provided on layer 2. As recognized by the Examiner in the office action, however, portions of light shielding layer 5 that are provided on layer 2, as illustrated in the drawings, have the same length on either side of the opening. Thus, JP'837

discloses the use of a symmetrical cross-section for the light shielding film, and not the asymmetrical structure as set forth in the present application.

As described in the "Background Art" section of the present specification, conventional devices, which were structured as shown in figure 4, have had the problem of reduced light efficiency, due to the fact that an optical axis of an interlayer lens, was not provided parallel to a central axis of the interlayer lens (line C-C'). As a consequence of this structure, less light could reach the receiving poritons 102.

In any event, Applicnats have further clarified this geometry in the amended claims.

Claims 2-6, 8-13 and 15 are patentable for at least the same reasons. With rspect to claim 12, it further is noted that JP' 837 cannot teach or suggest a method for making the presently claimed semiconductor apparatus having an interlayer lens wherein the interlayer lens is formed such that an optical axis of the interlayer lens is parallel to a central axis of the opening region, because JP' 837 does not teach or suggest an opening in light shield that is asymmetric about the center axis through the opening.

Thus, it is not seen how the presently claimed invention is anticipated by JP '837. Nor is it seen how the present invention would have been obvious to one of ordinary skill in the art in view of JP '837.

Claim 7 is rejected under 35 U.S.C. §103(a) over JP '837 in view of JP 4-111354 ("JP '354"). Claim 7 is patentable for at least the same reasons as discussed above. JP '354 fails to make up for the deficiencies of JP '837. JP '354 also fails to teach or suggest a semiconductor apparatus having an interlayer lens wherein the interlayer lens is formed such that an optical axis of the interlayer lens is parallel to a central axis of the opening region, wherein the light shield that is asymmetric about the center axis through the opening.

Thus, it seen how the present invention would have been obvious to one of ordinary skill in the art in view of any combination of JP '837 and JP '354.

In view of the discussion above, it is respectfully submitted that the present application is in condition for allowance. An early reconsideration and notice of allowance are earnestly solicited.

If for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, the Commissioner is hereby authorized and requested to charge Deposit Account No. **04-1105**.

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Respectfully submitted,

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